THE

HEALTH OF THE ROYAL NAVY CONSIDERED,

IN

A LETTER

ADDRESSED TO THE

RT. HON. SIR JOHN S. PAKINGTON, BART., G.C.B., M.P.,

BY

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"I conceive it to be the duty of every educated person to closely watch and study the time in which he lives, and, as far as in him lies, to add his humble mite of individual exertion to further the accomplishment of what he believes Divine Providence to have ordained."—*Speech of the Prince Consort in the City*, 1850.

"It is only by clearly and distinctly pointing out the causes which affect health that we can hope to avert disease, and reduce the rate of mortality in the Naval service."—*Statistical Return of the Health of the Royal Navy for the year* 1858.

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TO THE RIGHT HONOURABLE

SIR JOHN S. PAKINGTON, Bart., M.P.

Sir,

The active interest you evinced when First Lord of the Admiralty in all that concerns the thorough efficiency of the Navy — in regard, not only of the ships, their armaments and supplies, but also, and not less, of the hands which are to wield them— leads me to address the following observations to you, in the hope that they may thus possibly attract the notice of others besides the members of my own profession. Far too important is the subject to need any apology for seeking to bring it under the attention of all officers, the administrative and executive as well as the medical officers, of the service, and indeed of the public generally. It is now admitted, on all hands, that the strength and virtual efficiency of an armed force, whether afloat or on shore, is to be measured, not by the mere number of the names on the ship or regimental roll, however complete may be all the material equipments of the force, but really and truly by the actual number of hearty vigorous men who are, from day to day and from month to month, continuously available for fatigue duties of all sorts. Every man put on the doctor's list is so much power withdrawn from the full effectiveness of the living machine. Nay, it is more than this, for each such

loss forthwith becomes the occasion of extra duty being cast upon the well men to supply the void; and then, too, there is the time and labour of those who have to act as the attendants upon the sick to be taken into account. These consequences become a serious matter when sickness prevails to any considerable extent among a ship's crew. The energies of the well men are overtaxed, their hours of meal-time and sleep are interfered with, continued extra fatigue creates weariness and discontent; and this is the very state of system in which the health is liable to suffer from influences which it has hitherto resisted. Sickness thus gives rise to sickness in more ways than one; and this, too, is apt to go on in a progressively increasing ratio. Obviously, therefore, the necessity of averting or preventing to the utmost all disease, and of preserving as far as can be done uninterrupted health among a ship's crew, cannot be overestimated as one of the main objects to be aimed at by all who have at heart the duty of maintaining a powerful Navy, ready at all times for the defence and honour of our country. And the importance of the subject is yearly becoming greater, from the acknowledged difficulty that has often been experienced in recent times of promptly manning a large fleet upon an emergency, in consequence of the enormous demands of our mercantile marine for able-bodied hands in these days of increasing commercial activity.

My attention having been drawn, at various periods of my professional life, to the state of health of seamen, and specially on two occasions of official employment in the West Indies, and in the Black

Sea and Mediterranean,* along with numerous opportunities of converse with naval officers both at home and abroad, will plead my excuse for taking upon me, though not belonging to the service, the task of inviting public notice to the subject; and the extended inquiries which I have recently conducted into the general operation of quarantine have also brought to my knowledge much valuable information on the hygienic condition of ships, both of the royal and of the mercantile marine of different countries.† The very unconnectedness of my position may possibly not be without some advantage; but be that as it may, the truth and fairness of the following statements must be the best test of their value or otherwise.

Before proceeding to treat of the existing state of health of the Royal Navy, which is the special object of this letter, it will not be amiss to glance at its condition in the early part of the present century.

After the close of the great continental war, the distinguished veteran Sir Gilbert Blane, long one of the most eminent medical officers in the service, published his dissertation "On the Comparative Health of the British Navy, from the year 1779 to the year

* Report made by Dr. Milroy to the Colonial Office, on the Cholera Epidemic in Jamaica in 1850-51, &c. *Printed by order of the House of Commons,* May 1854.

Report to the Minister of War of the Proceedings of the Sanitary Commission, dispatched to the seat of War in the East, 1855-56. *Presented to Parliament,* March 1857.

† Papers relating to the Laws and Practice of Quarantine in Foreign Ports and in British Colonies, prepared by a Committee of the National Association for the Promotion of Social Science, and communicated to the Board of Trade. *Printed by order of the House of Commons,* Aug. 1860, and August 1861.

1814, with proposals for its farther improvement." He there pointed out the immense saving of health and life in ships of war that had been effected during his time, in consequence of successive ameliorations in the construction and sanitary arrangements of the vessels, and in the general condition and care of the men. For the last three years of the war, the annual death-rate from all causes throughout the different fleets he reckoned to average about 33 per 1000 of the entire strength, the aggregate of which for each year being put down at nearly 138,000 of all ranks and ratings—an enormous force certainly, in the gathering together of which but little attention could possibly have been paid in the selection of lives, more especially at a time when impressment was in vogue. Thirty years previously, the ratio of mortality had been far more than double, probably two-thirds, this proportion. Nor will this be wondered at when it is known that at that time ships were often like the then jails and prisons, with their holds so foul and noisome that "the air used to become so contaminated as in innumerable instances to produce instantaneous and irremediable suffocation";—and when the newly raised men were so huddled together on board filthy receiving vessels that fever was never absent from them, and numbers were cut off before they were even distributed among the ships of war, while hundreds perished of the same disease and of putrid flux before they had been many months at sea. Sailors died off in those days at a greater rate than even the troops, miserably bad as the condition of the latter was. Scurvy was then, from the bad provisions served out to the men, a

desolating scourge to the Navy; and such continued to be the case down to 1796-7, when lemon-juice was first regularly supplied to our ships of war, and the diet of the crews was improved. Yet twenty years before that time, Captain Cook had convincingly shown not only how this disease may be prevented, but also how, by the simple expedient of furnishing wholesome and suitable provisions and pure water, and by unremitting attention to the thorough cleansing and ventilation of a ship, the health of her crew may be so preserved that, in a three years voyage round the world, out of a company of one hundred and twelve men, but five in all should be lost—four from accidents, and one only from disease. Sanitary practice then, as now, advanced but slowly long after its benefits were demonstrated.

As scurvy was got rid of by improving the diet of the men, so fevers and fluxes were, if not got rid of, immensely kept down when ships were kept clean and better aired in every part, and when the crews were better treated and cared for in respect of their accommodation, clothing, and medical supplies.

By the great reduction in the death-rate of the Navy at the close of the continental war, compared with what it had been at its commencement, it was estimated that "two ships of war are now (1815) capable of more service than three of the same rate in former times"; in other words, one-third had thus been added to the effective force, and moreover an enormous expense, inevitably consequent on sickness and death, had been saved. Still the ratio of mortality in the Navy was justly considered by Sir Gilbert Blane as excessive; from disease alone, and

exclusive of all losses from accidents, drowning, and the casualties of war, it was in his opinion nearly double that among persons of the same ages in civil life. In his day, and for a good many years afterwards, there did not exist the means of determining with sufficient accuracy the vital statistics either of our general population or of the Navy. It was not till 1837 that the Registrar-General's department was instituted; and about the same time the Government first recognised the necessity of digesting and tabulating the returns of sickness and mortality in the two public services. The first issue of the statistical reports of the health of the Navy was in 1840; they embraced a period of seven years, commencing with the year 1830. Subsequently, but at long intervals, other reports for the septenniad from 1837 to 1843 were published. These bulky and unreadable Blue Books have of recent years been superseded by annual reports, which are infinitely more useful and instructive. The change was introduced after the late Russian war, and great praise is certainly due to the medical department of the service, and especially to Dr. Bryson, for the ability with which they are prepared. "The Medical Statistical Returns of the Baltic and Black Sea Fleets during 1854 and 1855" were issued in the early part of 1857; and these were followed by the "Statistical Reports of the Health of the Navy" for the year 1856, in the summer of 1858; for the year 1857 in 1859; and for the year 1858 in the spring of 1861.* It is from these more recent documents that the facts and data in the following

* The report for 1859 will, it is understood, shortly appear.

pages are mostly derived, and on which any opinions that may be expressed will be chiefly based.

The first point to be ascertained is, of course, what is the ordinary

Rate of Sickness in the Navy.

It may be necessary to premise that 1856 was nearly a year of peace; for, although the Russian war was not completely over till the early part of the spring, our fleet was not engaged in any hostile operations, at any time, either in the Black Sea or the Baltic; and it was not till the very close of the year that hostilities broke out in the Canton river. In 1857, our differences with China required a considerable increase to be made in the naval force on that station; most of the ships were long anchored in the Canton river, and their crews were much exposed to the malarious influence of its shores, besides having frequent sharp encounters with the enemy. The fleet of mandarin war-junks was destroyed on the 1st of June. On the 28th of December, the city of Canton was attacked; and next day, the walls were scaled, and the city and adjacent heights were taken. This year, too, the great Sepoy revolt took place, and the Naval Brigade, formed by detachments from the *Shannon* and the *Pearl*, joined the military force before Lucknow.

In 1858, the East India and China squadron was still further increased, and was actively engaged throughout the whole year both against the Chinese, and against the Indian mutineers. Three battalions of marines were for several months quartered in and around Canton, and had most severe and harassing

duties to perform in that unhealthy climate. The expedition against Tien-tsin on the Peiho took place in May; the defences in the river were taken by assault on the 20th, and the town was captured on the 26th of that month. The active aid given by the Naval Brigade in India is well known.

In 1856, when the aggregate mean force of the Navy was 51,730, the average number of men daily on the sick-list throughout the service was 3,132, or in the proportion of sixty-two men in every thousand; in other words, a seventeenth part of the whole force was continually off duty from the effects of sickness or injury, either on board ship or in hospitals on shore.

In 1857, the daily sick-rate was very nearly the same, being only a fraction less. The aggregate force that year was 42,470.

In 1858, the rate was higher, being in the proportion of sixty-six sick men in every thousand. The number at all times ineffective, out of a total force of 43,120, averaged 2,859, or about one in every fifteen men.

The sick-rate varies much, of course, in the different fleets into which our Navy is distributed, according to the stations where they are employed, viz.:—the Home, the Mediterranean, the North American and West Indian, the Brazilian, the Pacific, the West African, the Cape of Good Hope, the Australian, and the East Indian and China. To these nine fleets must be added the Irregular force, engaged on various stations, as the exigencies of the service require.

The amount of sickness is usually lower in the

Home, the Mediterranean, the Pacific, and the Australian stations than in the other fleets; but the rates vary so much in nearly all of them, from year to year, that no very positive or uniform statement can be made on this head. One year the North American and West Indian squadron is very healthy, the next year it is extremely sickly. The same thing may be said of the Brazilian squadron of recent years; formerly, it was invariably one of the most healthy. Two only of the fleets uniformly exhibit a high rate of sickliness, namely, that on the West Coast of Africa, and still more that on the East India and China station, which of late years has always stood highest on the list. The Irregular force also generally exhibits an unfavourable return.

The following table shows the mean strength and the average sickness-rate of the different fleets for the three years 1856, '57, and '58, taken together, and will suffice to give a pretty fair idea of the relative importance both as to numbers and the comparative healthiness of our naval forces employed in different parts of the world, however much the exact numbers, etc., vary from one year to another.

FLEETS.	Mean strength for the three years.	Average daily Sick-rate for the three years.
East Indian and China	7263	93 per 1000 men.
Irregular	7117	69 " "
West Coast of Africa	1707	68 " "
Cape of Good Hope	1030	59 " "
North America and West Indies	4365	58 " "
East Coast of South America	1323	55 " "
Pacific	2387	53 " "
Mediterranean	7867	52 " "
Home	11,814	50 " "
Australian	437	46 " "

The number of days spent in the course of the twelvemonths on the sick-list, either on board ship or in hospital on shore, affords another means of showing approximately the loss of effective service on each of the various stations, and also over the entire aggregate force. Without going into details, it will be sufficient to state that in 1856 the total number of days' sickness throughout the Navy was such as to give twenty-two days off duty to each man employed; that in 1857, the proportion was a trifle more; and that in 1858 it was still higher, being rather more than twenty-four days on the sick-list to each man.

From the sick-rate, or amount of constant temporary loss of effective strength arising from disease or injury, I now pass on to note the amount of the permanent losses caused by death and by invaliding.

The Rate of Mortality in the Navy.

This varies, as might be expected, very considerably in different years, not only on separate stations, but throughout the service generally; and this, too, quite independently of the casualties of war and of all other accidents, including drowning, to which seamen are specially exposed.

In 1856 the general death-rate from all causes was 15·5 in every thousand men. In 1857 the proportion was 22 per thousand; and in 1858 it was 25·8, or nearly 26, per thousand. As these rates include the deaths from violence and drowning, as well as those from sickness, it will be better for the present to leave the former out of consideration, and attend only to the amount of mortality from the effects of disease, as a better standard will thus be

afforded for comparing the health of the Navy with that of other bodies of men about the same period of life.

In 1856, the deaths *from disease alone*, throughout the service, were in the proportion of 12.1 in every thousand of the force; in 1857, it was in the proportion of 14·7; and in 1858, it was in the proportion of 20·2. The general average for the three years was therefore between 15 and 16 per thousand men. From the following table, which gives the mean total and the disease death-rate for the three years, the reader will be able to judge of the relative fatality of the different stations on which our ships of war are engaged.

STATIONS.	Mean Death-rate for the three years.	
	From Disease alone.	From all causes.
Home	7·8	10·3
Mediterranean	8·4	11·6
North America and West Indies	19·8	24·
Brazilian	21·	25·2
Pacific	6·9	8·7
West African	14·3	20·5
Cape of Good Hope	10·2	16·3
East Indian and China	37·7	47·6
Australia	3·6	9·9
Irregular	8·3	12·4

The extremely high death-rate of the East Indian fleet will be noticed. It has been seen that two of the three years were years of war, both in China and in the East Indies. In 1856, the death-rate was only 27 per thousand from disease, and 34 from all causes. In 1858, it was 51·9 from disease, and 62·5 from all causes.

The Rate of Invaliding in the Navy.

The other cause of permanent loss to the service, from year to year, is the discharge of all the men who are hopelessly unfit for future duty in consequence of grave organic disease, or of some incurable infirmity.

In civil life, the annual death-rate is our only available test in estimating the healthiness, or otherwise, of the community, or of any large portion of the community. No means, as yet, exist for ascertaining, as in our army and navy, the Statistics of Sickness among the population of our towns and rural districts. And as to any elimination of invalids among civilians, the only discharge of them is by death. This circumstance alone presents a marked difference in the elements of any comparison instituted between the ratio of mortality in naval and military life on the one hand, and among working-men of the same ages in civil life, on the other; greatly, of course, to the advantage of the former by so many incurable sailors and soldiers having been discharged, and whose deaths on shore go to swell the mortuary returns of the latter.* What addition should be

* Keeping this observation in view, the reader may compare, in the following table, the death-rates in different bodies of men at sailors' ages among our civil population, with that, from all causes, in our home fleet, as given above:—

London Fire Brigade	7·	per 1000 of strength.	
Metropolitan Police	7·6	"	"
England (healthy districts)	7·7	"	"
Agricultural Labourers	8·	"	"
Out-door Trades in towns	8·5	"	"
City Police	8·9	"	"
England	9·2	"	"

The signal reduction in the death-rate among our troops at home,

made to the death-rate from disease in the Navy to bring it more upon a par with the death-rates in civil life, for the purpose of comparison, it is not easy to determine. It cannot be less, I should think, than six or seven per thousand of the strength at the least.

In 1856, the number of men invalided was 998, or in the proportion of rather more than nineteen in every thousand of strength. In 1857, the number invalided was 1460, or rather more than thirty-four per thousand; and in 1858, the number was 1763, or nearly fifty per thousand. The mean rate for the three years together, in the entire Navy, was therefore between thirty-one and thirty-two in every thousand men. To show how much this varied in different fleets, it may be stated that on the Home Station the rate was twenty-three, while on the East India Station it was fifty-two, per thousand.

By putting together the number of deaths, and the number of men discharged as invalids, in the course of the twelvemonths, the yearly total permanent loss to the service is ascertained. In 1856, this amounted to 1799 men, out of an aggregate strength of 51,730. In 1857, it amounted to 2404, out of an aggregate of

within the last three years, has been such as to bring it nearly to that in the healthy districts of England. Formerly, it was more than double. That this marked decrease may be in part the effect of greater care in the selection of the men, and of a larger proportion of the force consisting of men recently enlisted, is not unlikely, as the same result has been observed in the case of other bodies of men. Thus with the Fire Brigade, the deaths, for the first thirteen years of its establishment (as Dr. Guy has told us in his valuable paper on the *Mortality of the British Army*) were at the rate of 9.6 per thousand; while for the last twelve years they have fallen to 7—a result due, he thinks, mainly to the more careful selection of the men.

42,470; and in 1858, out of an aggregate of 43,120, it amounted to 2878, or a loss equal to the combined crews of three of the largest line-of-battle ships in the Navy.

To put the facts in another way; the proportion of total permanent loss to strength in 1856 was, throughout the Navy, 34·8 per thousand men; in 1857, it was 53·8 per thousand; and in 1858, it rose to 66·7, or a full fifteenth part of the whole strength. If we take one or two fleets by themselves, we find that, on the Home Station, the mean rate for the three years of the total permanent loss was thirty-three per thousand; or, deducting all the losses attributable to violence and accident, that it was at least 28 or 29 per thousand of the strength. In the East India fleet, the mean total loss for the trienniad was at the rate of 95·9 per thousand, or little short of ten per cent. of the force per annum.

Diseases, &c., most prevalent in Ships of War.

Having now determined the general facts as to the absolute and relative amount of Sickness, Mortality, and Invaliding among the seamen of our Navy, the next point is to find out the principal causes which contribute to the production of the temporary, as well as of the permanent, losses sustained by the service from one year to another. Avoiding all minute details, as suited for the professional rather than for the general reader, it may be stated that about one-half of all the entries on the sick-list are due to ailments of a slight, or at least non-serious, nature, and consist mainly of venereal complaints; or of boils, ulcers, and skin diseases; or of trivial wounds and

contusions. This moiety of the sickness occasions but a fraction of the losses by death and invaliding (considerably more by the latter than by the former), and may, therefore, be passed over with the single remark that the extensive prevalence, in some fleets, of the first named group, is a subject which seems to call for some attention on the part of the authorities in sea ports, not only in consequence of the serious amount of temporary loss of service thus occasioned, but also from the consideration that the constitution of many men is thereby gravely damaged, and rendered doubly or trebly susceptible of some other diseases, which cause much of the permanent losses from one year to another.*

The diseases which occasion by far the greatest amount of mortality in the service are (1) fevers, (2) diseases of the bowels, and (3) diseases of the lungs, etc. It is, therefore, these three groups of sickness which demand our special attention, more particularly in regard to the causes which favour their production and enhance their fatality. But before going into particulars, a preliminary remark or two requires to be made.

Some Ships more Sickly than others.

The first point, which must strike every inquirer,

* "That a disease so destructive of health and happiness, which, by an acquired constitutional taint, may be transmitted to generations yet unborn, should be allowed to go on increasing in our large sea-ports to an extent unknown in any other part of the world, is greatly to be deplored; but so long as the municipal authorities of those towns, where it is most rife, refuse to cooperate with the Government in establishing hospitals for the cure of the degraded creatures that swarm along their pavements, it will be in vain to hope for any abatement of the evil."—*Report on the Health of the Navy*, for 1856.

is the marked difference between different ships of the same squadron in respect of healthiness, or otherwise. While some ships are very sickly, others similarly employed, and apparently exposed to like external or atmospheric influences, are at the same time comparatively healthy. When such an occurrence is observed in a dwelling or cluster of dwellings on shore, the idea at once suggests itself that the difference must be due to some local cause—either to the good or bad sanitary condition and arrangement of the houses, or to a difference in the constitution and hygienic peculiarities of the occupants, arising from diversity of age, diet, occupation, etc.

It is not always easy at once to discover the chief cause or causes of the insalubrity, and mistakes are often commited by men who, under the influence of a favourite doctrine, are apt to confine their attention to one set only of agencies and overlook the effect of others. A house may, to the outward eye, be a picture of neatness and beauty, it may be as trim and clean as hands can make it, it may have been well constructed, with drains and sewers which are carefully looked after to prevent all obstruction, its sitting rooms may be well aired and as fresh and sweet throughout the day as can be desired;—and yet in such a dwelling some of the inmates, whose health previously had been good, are constantly ailing; with head-ache, loss of appetite, and general malaise and debility, if not with bowel and febrile complaints. And all this may be owing to some overlooked and unknown old cess-pit under or close to the basement; or to the foundation being damp and unaired; or to a stagnant pond or manure heap close by; or it may

be that the doors, windows, and register stoves of the principal bedrooms are so carefully fitted, that not a breath of air can pass in or out of the rooms at night; or that too many of the domestics may be sleeping in one chamber, and this may be on an ill-ventilated basement floor, or over a stable or outhouse where dust and other refuse are allowed to lodge. Or failing any of these evils, the water supply may have acquired some taint or noxious impregnation, which slowly but surely affects the health. However obscure at first may appear to be the cause of the mischief, we may be assured that in sanitary problems, just as in the problems of other physical sciences, a solution of most phenomena may be confidently looked for from exact and patient inquiry. What has been said about a house equally applies to a ship, which is only a floating detached dwelling, often moored in an unhealthy site, and in frequent communication with other separate dwellings of the same sort, and with the villages and towns on shore.

The greater sickliness of some ships over others may be for one season or year only, or it may continue for two or three years in succession. Occasionally a ship has been so uniformly unhealthy, whenever it has been put in commission, that she acquires a thoroughly bad name in the service.

I will give two or three examples of notably unhealthy ships.

The *Hannibal* was in 1855, and again in 1856, very sickly. When in the Black Sea in the former year, besides suffering from bowel complaints more than the rest of the fleet, no fewer than 207 cases of typhoid fever occurred among her crew of 830,—"while

other ships of the same size and similarly engaged had not a fourth or a sixth part of the number." The fever continued to infest the ship in the following year, when stationed in the Mediterranean; it appeared to be but little influenced by the locality where she was, or by the duties in which the men were engaged. As suggested in the Returns, this sickness must have depended "upon a cause within."

The *Conqueror* and the *Centurion* were commissioned about the same time at Devonport, and served in the Mediterranean during 1857 and 1858. The former had a crew of 900, and the latter one of 740; both seem to have been similarly engaged during the whole period. Yet, in both years, there were more than ten times as many cases of low fever (besides a great excess of bowel complaints, erysipelas, and ulcers, as well as of chest and throat complaints) in the *Conqueror* as in the *Centurion*. "It is obvious," Dr. Bryson remarks, "that there existed some radical defect in the sanitary condition of the former, or that the physical condition of the one ship's company was far inferior to the other."

The *Dauntless* frigate while on the West India station in 1852-3 lost nearly seventy of her crew, within a few weeks, from yellow fever, which went on attacking the men as long as they remained on board, and only ceased when the whole ship's company were landed at Barbadoes. Throughout the Russian war, she served first in the Baltic and then in the Black Sea. Her sick-rate was high throughout the whole time; and the number of cases of fever, in each year, was very much in excess of what occurred in other vessels of her class.

It is quite true that when a ship has got a bad name on the score of health, more may sometimes be made of any future sickness on board of her than of other vessels to which no black mark may be attached; nor can we wonder at this, as it is scarcely possible for any one sailing in her to divest his mind of her health antecedents, and it is well known that the mere suspicion or dread of a sickness will often go a great way in inducing it, and certainly in aggravating its nature—a strong proof, by the way, of the value of a good repute, and of the necessity of preventing to the utmost any tendency to mental depression or alarm among a ship's company. Nowhere is panic from a pestilence so dreadful as on board ship at sea. But that there was some hurtful physical cause present in the *Dauntless* is, at all events, highly probable, when the history of the *Rosamond*, formerly the *Eclair*, is considered. Besides the disastrous loss of so many of her crew from yellow fever, in 1845, and the reappearance of a similar disease on board a year or so afterwards, when commissioned under a new name, she again proved an extremely sickly ship in 1852 on the West India station, and again in 1854 when employed in the Baltic, being there infested more than any other ship of the fleet with low fever and other zymotic maladies, and her daily sick-rate averaging the enormous proportion of 8 per cent. of her crew, throughout the whole period. The ventilation in her between-decks is stated to have been most imperfect, besides other causes of insalubrity to be afterwards noted.

Causes of Insalubrity in Certain Ships.

It is, obviously, of primary importance to determine the probable causes of the marked unhealthiness of some vessels in a fleet over others, seeing that it must be mainly on a solution of this very point that the question as to the improvability of the health of our Navy turns. In some instances the causes appear sufficiently palpable; in others they can only be surmised; while, not unfrequently, they seem to have hitherto eluded research. In the Navy as in the Army, and in civil life too, the subject of the causation of diseases, and, consequently, the only secure ground for their prevention, has not uniformly been appreciated as its great importance demands. Every year, doubtless, the matter will be more and more attended to, not only by medical men without exception, but also by all executive officers in command of our ships and troops, as well as by municipal and other authorities on shore.

One simple truth may be confidently stated, viz.—that the liability to disease is in general greatly dependent upon, and often is commensurate with, the purity of the air which is breathed throughout the four-and-twenty hours. There is no exception to this law, in any climate or under any condition, at sea or on land. Now there is a two-fold source of impurity in the respired air to be always guarded against. The one source is extrinsic or arising from something external to us, it may be from a marsh, or a foul gutter or drain, or any collection of decomposing matter, which gives off a noisome moist effluvium. The second source is intrinsic, and is unceasingly being supplied by emanations from our own

bodies, independently of any external cause of malaria or miasm. The second of these evils is much the more dangerous of the two; the poison so exhaled is more injurious to health, and its presence is infinitely more common, following us wherever we go, and only avoidable by unceasing vigilance in maintaining the renewal of fresh air around us.*

That both these sources of atmospheric impurity are at times apt to affect mischievously the crews of our ships of war, appears from the following brief instances out of others, cited in the recent official reports. And first as to some of the effects of overcrowding and defective ventilation.

Fever.

Forty cases of fever occurred in the *Eurotas* frigate, while in the Mediterranean, between April and June 1856. Her medical officer "was unable to account for the disease, unless it arose from the extreme lowness and closeness of the deck on which the men were berthed."

In the *Valorous*, an outbreak of fever took place in May 1858, on the passage from Ferrol to Plymouth, where fresh cases continued to occur for some

* "Air contaminated by foul and stagnant exhalations, particularly those from the living body, is the ascertained cause of typhus fever, which has been a more grievous and general source of sickness and mortality in the navy than even the scurvy. * * * The infection of fever is generated by the breath and perspiration of men, crowded for a length of time in confined air, and without the means of personal cleanliness."—Sir G. Blane.

The case of the Egyptian frigate, which arrived last year at Liverpool with her crew in such a wretched condition, and occasioned so much alarm at the time in that city, was one out of many instances of the truth of these remarks.

weeks after her arrival. Three proved fatal. "With the exception of a somewhat imperfect ventilation, in consequence of the main deck ports having been caulked in, previous to her departure for Ferrol, no cause (of the sickness) could be discovered" by a board of executive and medical officers appointed to examine the ship.

Thirty-four cases, six fatal, occurred among the crew, 825 in number, of the *Princess Royal*, while conveying a portion of the 11th regiment from Malta to Alexandria, between the 4th and the 17th of January 1858. The first case was on the sixth day after leaving Malta, and the rest within the next fortnight. As to the cause of the outbreak it is stated that, in consequence of the boisterous weather, "it was necessary to keep the ports, both on the main and lower deck, barred in during nearly the whole of the passage." The spread of the disease seems to have been checked by removing the men from the lower to the main deck. Other ships of the line carried a larger number of troops without detriment. Thus the *Majestic* conveyed 800 troops from the Crimea to England in the summer of 1856, and not a single case of fever occurred among her crew. But the previous history of the *Princess Royal* shews that, though a new ship, she was very sickly in 1855 while in the Black Sea. She then lost more men from fever than any other ship in the fleet, or than even the Naval Brigade serving before Sebastopol, notwithstanding all their exposure to wet and cold and their incessant toil in the trenches. In 1857 also, a bad form of fever broke out on board of her at Corfu; 3 out of 17 cases proved fatal. As the *Royal*

Albert, which was lying there at the same time, remained free from any febrile attack whatever, the disease must have been owing rather to some cause connected with the ship herself, than with the locality. Her crew had, moreover, in the early part of the same year, while at Lisbon, suffered much from ulcers, and phlegmonous disease.

It will be afterwards shewn how much the malignant fever of the West Indies, etc., is aggravated by defective ventilation on board ship.

Cholera, &c.

Three or four days after this disease appeared in the *Megœra*, at Calcutta in 1858, she put to sea. The next day the number of attacks had increased. Subsequently, the boisterous state of the weather requiring that the main deck ports should be kept closed, all the sick, etc., were put on the upper deck under an awning. From that time, the disease subsided and soon ceased entirely. Within a fortnight, nearly an eighth part of the crew had perished.

About the same time, the *Pylades* was attacked on her way from Calcutta to Trincomalee; "the sick were discharged into the receiving ship (on her arrival there), where, under the influence of better ventilation and a more suitable diet, the disease soon ceased entirely."

The most memorable instance on record of the effects of defective ventilation on the fatal progress of cholera occurred in 1854, in the *Britannia* while in the Black Sea, and just before the sailing of the expedition to the Crimea. Within five days or so, no fewer than 229 out of a crew of 920 were at-

tacked (besides nearly 400 with diarrhœa), and of these 139 died. The ship had put to sea in the hope of getting rid of the disease, which had begun to appear on board of her and some other ships of the fleet at Varna. For a day or two the change appeared to have done good; but the weather became boisterous and all the lower deck ports had to be closed. Thereupon, the pestilence broke out in its full fury in the course of the following night. On returning to Baljik, the whole crew were removed into some empty transports; and there was an end of the disease. The total loss of life from this short outbreak was considerably more than double all the fatal casualties, on board the whole fleet, from the fire of the enemy in the attack against the sea batteries of Sebastopol. None of the officers of the *Britannia* died from cholera. Such a fact is always significant.

The tendency to diarrhœa and dysentery is always observed to be much increased, and their obstinacy and severity to be greatly aggravated by defective ventilation on board.* These are generally the most common and fatal diseases on board crowded troop and emigrant vessels; ships of war also have often suffered most severely from their prevalence. The same thing may be said of another occasionally most troublesome and disabling set of maladies in long voyages, viz., ulcers and erysipelas. Several of the large ships of our Baltic fleet in 1855 suffered seriously from this cause. The surgeon of the *Colossus* considered that "the crowded state of the decks and

* "The dysentery, which stands next in order (to fever) in point of fatality, is also generated and propagated by the want of cleanliness and ventilation."—Sir G. Blane.

the want of personal cleanliness among the newly-raised men, combined with imperfect ventilation on the orlop deck (where most of the attacks occurred) were the principal causes of the disease."

The *Calcutta*, the admiral's ship, on her voyage out from England to Hong Kong in 1856, had an unusual number of cases of ulceration on board. "I have no hesitation in saying," writes the surgeon, "that the sick berth is manifestly the head quarters of the disease, where large numbers of suppurating sores have been congregated together in a confined and overcrowded place." When a portion of the crew was landed, and better ventilation of the decks established, together with an ampler supply of fresh provisions, the tendency to sloughing ulceration ceased.

The preceding instances of the evil effects of Overcrowding on board ships of war entirely accord with the experience of the army and of civil life, in close unwholesome barracks, workhouses, etc.

Effects of Impure Holds.

The other cause of atmospheric vitiation occasionally on board ship is the admixture of malaria from impurities in the hold, etc., of the vessel, or from her own timbers in a state of decay. The following recent instances from the Navy Returns illustrate this point.

The great sickliness of the *Rosamond* in 1854, previously mentioned, was ascribed by her surgeon to the state of her hold. "Several cases" (of typhoid fever) "occurred in men employed in cleaning the bilges; there was a considerable accumulation of filth

under the magazine. Whenever the hatches were kept closed for a time, a foul smell was perceived on opening them." A like state of things was reported of this vessel eight years before.

In 1856, the *Herald*, on the Australian station, suffered much from alvine flux, while cruising among the Feejee Islands. "The greater number of the cases occurred amongst the men berthed on the port side of the lower deck. The gunner's store-room was therefore cleared out, and some very offensive matters were discovered, which produced nausea and faintness in one or two of the men employed on that duty." With the thorough cleansing of the hold, the disease seems to have subsided until the following year.

The *Hecaté*, one of the West African squadron in 1858, had sixty-three cases of fever (which in several instances had the character of the less aggravated form of yellow fever) among her crew of a hundred and thirty-two, during the more healthy part of the year between February and May, and chiefly while she was at sea, cruising between the coast and the island of Ascension. Her surgeon was of opinion that the sickness was mainly due to fœtid exhalations, so offensive as to cause nausea and headache, from the hold, which was found to be exceedingly foul from the accumulation of a quantity of rubbish and black mud. "But the most offensive effluvium seemed to come from the wood lining the inside of the hull, which was in a state of decay, and in some places covered with fungi, so that it crumbled away before the common iron scraper."

Another of the African squadron that year, the

Hydra, was similarly affected. Forty-two in a crew of a hundred and twenty-five were attacked, while at sea. Large quantities of black stinking mud were taken out of her hold.

In the course of the same year the *Boscawen*, the admiral's ship on the Cape of Good Hope station, had thirty-six of her crew smitten with fever; "the cause of which appears to have been connected with the state of the hold." Five of the cases were fatal. Besides fever and bowel complaints, boils and ulcers were rife among the crew; out of six hundred and eighty men, eleven died and twelve were invalided from disease alone in the twelve months.

To what extent the two causes of insalubrity above-mentioned operate in the production of sickness in our ships of war in the present day, it is not possible to say with any degree of certainty. That, as compared with what existed in the Navy sixty or seventy years ago, they are now feeble and infrequent is known to all who are acquainted with the medical history of the service. Even since the close of the great continental war in 1815, a notable reduction in the losses from disease among our seamen has taken place in consequence of various improvements, sanitary and hygienic, on board ship; and still more recently, the death-rate in some stations appears to have been lower than it used to be in previous years.

These general facts suffice to show how much the effective strength of our Navy is dependent on the due observance of the established laws of health, and should serve to encourage us in pursuing a like philanthropic course of carrying into effect, to the utmost, every amelioration which the progress of science may indicate.

Diseases most Disabling and Fatal in the Navy.

I will now briefly analyse the recent mortuary returns of the Navy for the purpose of determining the relative mortality produced by different classes of disease, so that the reader may understand what are the principal causes of the permanent losses sustained by the service from year to year. Out of the 2,125 deaths from disease alone during the three years 1856, '57, and '58 (the total loss from all causes amounted to 2,735), 559 were due to fevers, chiefly of the continued type; 715 were due to diseases of the bowels, chiefly alvine flux and Asiatic cholera; 440 were due to diseases of the respiratory organs, especially to consumption. On each of these three classes I shall make a few remarks; and first of

Fevers.

This class of diseases varies much in frequency and fatality in different years upon all the stations, so that the experience of any one year alone might give a very illusory idea either of their local or of their general prevalence.

Fevers occasion but little of the sickness or mortality in the Home fleet. The annual number of deaths from this cause does not average more than eight or nine. Very many of the attacks are the result of intemperance and exposure to wet and cold, when the men get leave to go on shore. As might be expected, a large proportion of these cases occur in some of the ships at Portsmouth and Devonport. Occasionally, however, the fevers contracted there are of a more serious character, being of a decidedly

typhus or typhoid type. Thus, in 1857, the *Blenheim*, the steam guard-ship at Portsmouth, had nineteen cases of this sort among her crew; the attacks occurred "at the same time that a severe epidemic prevailed among the marines at Fort Monkton and at Forton barracks." The fever in the *Blenheim* was preceded by a prevalence of diarrhœa, in some cases of a choleraic character, on board. In 1858, forty-one cases of fever occurred in the *Victor Emmanuel*. The extensive mud-banks around that harbour are said to be but little, if at all, productive of any febrific malaria, or of other noxious effects upon the health of the crews in the port. The same remark is made, in the official reports, as to the mud-flats along the line of the Southampton water. Very different, however, is the case with the estuary of the Medway, which is decidedly the fever locality on the Home station, and where not only a considerable number of cases of fever, but also much other disabling sickness, annually occur among the crews of our ships of war and the workmen in H.M. dockyard, as well as among the civil population of Sheerness and its neighbourhood, from malarious agency. The fevers are generally more or less periodic or agueish in their type; occasionally they are attended with severe gastric and bilious symptoms, and then they are usually more typhoid in their character. The ships anchored high up the Medway generally suffer more than those off Sheerness, which lies open to the winds from the German Ocean. The extremely insalubrious state of that town and of the country round, as affecting the health of the population both afloat and on shore, was brought before the attention of the Privy

Council in 1859; but whether any improvement has since been effected, I am unable to say. In the Appendix are given some of the details respecting the amount of sickness in the ships of war and among the workmen in the naval dockyard, which seem strongly to call for the attention of the Government.

Fevers are generally three or four times as frequent and as fatal in the Mediterranean as in the Home fleet. The majority of the cases are of a mild continued or remittent type; a fifth part or so are intermittent. The average frequency of febrile attacks of all sorts in our ships of war on that station seems to be about seventy in every thousand men, during the twelve months. The annual death-rate from this cause has averaged about two in the thousand. On this, as on other stations, the fever-sickliness of certain ships, while others remained exempt, was very marked in each of the three years.

I now pass to the West India station, where, of recent years, by far the greatest amount of fatal fever has occurred in our naval force. Fully one-half of all the deaths from fever throughout the service, in the three years under consideration, were caused by that fatal pestilence know as yellow fever. Much instructive evidence may be gathered from the details, although in many respects these are insufficient, given in the official reports respecting its history on ship-board.

In 1856, it prevailed with virulence in four ships of the West India squadron, which numbered thirty-seven vessels in all. In one ship, the *Malacca*, it raged with such violence that no fewer than fifty-six

out of a crew of one hundred and sixty-five perished within six or seven weeks. Many of the vessels of the squadron escaped altogether, while others had only two or three sporadic cases of the disease.

In 1857, out of a squadron of twenty-five vessels, two only suffered to any considerable extent. One, the *Brilliant*, lost thirty-four out of a crew of two hundred and thirty in five or six weeks; and the other, the *Orion*, had fifteen deaths; and the notable fact in the case of this ship was that most of the fatal attacks occurred after leaving the West Indies, and during her voyage to England; three actually occurred in the naval hospital at Plymouth.

In 1858 the squadron suffered much less severely, the total mortality from the disease that year being only eighteen. Seven of the deaths occurred in the *Leopard*.

This very fatal form of fever appears to have been, at times, more destructive in our ships of war within the last fifteen or twenty years than was ever known before. All the vessels which have been smitten most severely have been steamers. No sailing ships in former times seem to have sustained such terrible losses as the *Eclair* in 1845, the *Dauntless* in 1852, the *Malacca* in 1856, and the *Icarus* in 1860. This fact is very suggestive. That the excessive heat on board, without adequately free ventilation, has had much to do with the increased malignancy of the distemper is more than probable. It would seem, too, that the accumulation of dirt and other offensive rubbish under the machinery, etc., has in several instances added not a little to the impurity of the close hot air in the between-decks. Reference is fre-

quently made in the surgeons' reports to both these evils. On some occasions, particular parts of a smitten ship appear to have been the especial focus of the poisonous action. Thus, in the cases of the *Argus* and the *Virago*, it was "about the after part of the lower deck and in the fore-part of the engine-room," and the mortality was greatest among the men berthed near these parts; and, in the *Leopard*, nearly all the attacks occurred among the men living in the steerage, where they had been more exposed than the rest of the crew to "an offensive effluvium which had for some time previously issued from the hold and spirit room." On examination much black mud, mixed with half-rotten chips, which had been accumulating for a long time, was found in the limbers. "The exhalations from that part of the ship, the surgeon believed, were the cause of the yellow fever, as the malarious influences from the shore were the cause of the cases of remitting fever."

The prompt abatement, and often the complete cessation, of the disease when the crew of an infected vessel have been moved out of her into clean, airy quarters on shore or afloat, afford conclusive evidence how much the ship herself is apt to be the chief cause of its malignancy and persistence. One or two instances may be quoted. In the case of the *Argus*, the disease all but ceased at once after the crew, sick and well, had been landed at Bermuda. The surgeon was of opinion that "the fever was contracted from local causes exterior to the ship, but that the morbific poison became localised within her. Not one of the attendants at the hospital on shore

was attacked, whilst nearly all those who attended the sick on board became the subjects of the fever." In the case of the *Dauntless*, fresh cases continued to occur for weeks among the portion of the crew left on board, after the sick had been sent to the military hospital at Bardadoes, where they were placed in the same wards with other patients, without a single instance of the spreading of the disease. The same thing occurred in the case of the *Highflyer*, at Port Royal in 1852, and also in more recent instances.

For almost all practical purposes of prevention and arrest, yellow fever may be regarded in the same light as the typhus fever of our own country. All know how much the virulence and diffusion of the latter are under control by wise sanitary precautions; and nearly the same thing may be said of the former. Both are liable, in a confined impure atmosphere, to spread by contagion from the sick to the well; whereas the risk of such an accident is reduced almost to zero in the airy wards of a clean hospital. The inference from this fact clearly is that, by the simple expedient of securing an ample circulation of pure air at all times, but more especially from sundown to sunrise, to everyone without exception on board a sickly ship, the virulence and extension of the disease would be greatly controlled. The not unfrequent increase of the disease for the first few days after leaving harbour is doubtless owing to the impeded circulation of air in the between-decks, principally at night, from the closing of port-holes, etc. Whenever the sick have been treated in tents or under an awning on the upper deck, instead of in the usual sick bay, and the between-decks have

been kept freely ventilated, salutary effects have been always obtained.

The marked influence of a high temperature in favouring the development and progress of yellow fever, and of a cool climate in mitigating and arresting its course, is a point of much practical interest, as indicating the advantage to be derived by the removal of a sickly ship from the tropics to a higher latitude, when, notwithstanding the adoption of every available precaution, the disease continues on board. By increasing to the utmost the continuous circulation of air throughout the ship, and dispersing the men as much as possible, chiefly on the upper deck or decks, a certain amount of benefit is sure to be obtained. Instances, however, will occur where the only safety is in leaving the West India station as quickly as possible, and moving to the northward. Much fresh sickness, and even considerable mortality, it is however to be remembered, may take place during the passage, and before the vessel is able to reach a sufficiently cool climate, if the crew continue to occupy the close and infected between-decks as hitherto. Thus, the *Malacca* had eleven deaths on the passage (eleven days) from Port Royal to Bermuda, and thirty-eight fresh cases of the fever. The *Firebrand* lost ten men on the passage (twelve days) between Port Royal and Halifax, and had on arrival no fewer than seventy-nine of her crew laid up. The *Spiteful* took seven days in going from Nassau to Halifax; eleven men had died on the passage, and there were forty-six cases of fever on the sick list when she reached that port. Occasionally, from stress of weather, the voyage from the West Indies

to the North is rendered very tedious, occupying as many as twenty days to Halifax; and in a few instances, the sick ship, being unable to reach even Bermuda, has been forced to bear up for England.*

These circumstances serve additionally to shew how much this subject—the outbreak of yellow fever in our vessels of war—calls for a thorough inquiry into all the circumstances which may, on the one hand, favour, and which, on the other hand, may mitigate or arrest its virulence on board ship. The necessity for such inquiry is strongly urged in the last published Statistical Return, that for the year 1858, in consequence of the very disastrous loss of life in several vessels of the squadron during the past year, —so disastrous that Admiral Milne has recently given orders for the more prompt abandonment of the tropics by all infected ships in future.

The West Indies is not the only station which has suffered from yellow fever. The fleet on the east coast of South America sustained serious losses from

* H.M.S. *Barracouta* sailed from Jamaica for Bermuda on the 24th October, 1860. Yellow Fever appeared during the passage; besides her ordinary crew, she had upwards of a hundred supernumeraries on board. On arrival at Bermuda, "the civil authorities, dreading the introduction of the fever into the island, would not permit any communication, or allow the sick to be landed. Medicines, fresh provisions, and other necessaries were, however, sent on board." While making for Halifax, she encountered a violent gale which compelled her to shape a course for England, where she arrived on the twentieth day after leaving Bermuda. Of twenty cases of fever on board, six proved fatal.

If the above statement, respecting the conduct of the civil authorities at Bermuda, be correct, this was most reprehensible, and surely calls for official explanation. It may seem strange that the naval authorities did not insist upon the sick being landed, especially as there is a separate naval hospital on one of the islands, and as the *Barracouta* was also very much over-crowded at the time.

this disease in 1856-57-58, as well as in some previous years. Formerly, the Brazilian station was singularly healthy and exempt from all malignant fevers. From 1830 to 1843, the yearly death-rate in the fleet there did not average more than a trifle over seven per thousand of the strength—a ratio less than that upon the Home station. But for the last ten or twelve years it has been very much higher; and this in consequence of the yellow fever, which first appeared in Brazil in 1849-50.

On the Pacific, the Cape of Good Hope and the Australian stations, fevers are comparatively rare and mild. In our West African squadron, there has been a great reduction for a good many years past in the mortality from this cause, the annual death-rate therefrom not having exceeded during the trienniad under notice five per thousand of the strength.

This reduction has been owing in part to the absence of the malignant form of yellow fever from the African coast in that period, and for three or four years previous; in part also, to the salutary changes which have been introduced, mainly on the recommendation of the medical department of the service, into the mode of conducting the duties of the station. "By a wise and humane regulation, the deadly practice of sending boats away on detached service, to watch or intercept slavers, has been interdicted, or, at all events, greatly restricted. Prize crews are no longer turned adrift to wander through the streets of Sierra Leone, where the vessels they navigate from distant parts of the station are delivered up to the authorities of the mixed commission court; the orgies of 'the barn,' which lowered the character of the

white man in the eyes of the black, have long since ceased; and last, though not least, the introduction of quinine wine as a preventive of fever has not only reduced the number of febrile attacks, but has lessened the severity of those which do occur; and thus the mortality has also been reduced to a level which does not materially exceed the death-rate from fever on some of the more healthy stations."

Eruptive Fevers.

This class of diseases is, as might be expected, comparatively rare among seamen. Occasionally, measles and scarlatina appear in particular ships, chiefly on the Home Station. But the only exanthematous fever requiring notice is the small-pox.

The extent to which this disease has of recent years existed in the Navy will be seen from the following facts. In the Black Sea fleet in 1854 and 1855 there were eighty-one cases, of which five proved fatal. In the Baltic fleet during the same years, three hundred and three cases occurred (eighty-five in the *Neptune* line-of-battle ship alone), and of these eighteen were fatal. In the majority of instances, the disease seems to have been caught in Portsmouth or Plymouth before the ships sailed.

In 1856 the total number of cases of small-pox throughout the entire service was thirty-nine. They occurred chiefly in the Home and Mediterranean fleets. Three of the cases ended in death. Whether the patients had been vaccinated or not, is not stated. In 1857 the number of cases in the service amounted to twenty—ten on the Home, and six on the East India station. No case proved fatal. In 1858 the number

of cases was eighty-three—forty-seven on the Home, and thirty-one on the East India station. There were ten deaths.

"By a circular recently issued by the Director-General, the medical officers of the Navy are instructed to vaccinate, on their entry into the service, all persons who do not present marks of variola, or of previous vaccination. This will, no doubt, tend to lessen the virulence of small-pox, and to reduce the mortality consequent upon it." On more than one occasion, our ships of war have introduced the disease into populations on shore. Thus the destructive epidemic at Malta in 1830, when fifteen hundred deaths occurred, was said to have been brought to the island by H.M. ship *Asia;* and it was only last year that two seamen, from H.M. ship *James Watt*, were landed with the disease at Gibraltar, but where from the precautions taken it spread to a limited extent only.

Diseases of the Bowels, chiefly Alvine Flux and Cholera.

There is one station where these diseases prevail with unusual severity in almost all years, causing the principal amount of sickness and mortality among the fleet employed in that part of the world, viz., the Indian and Chinese waters. On all the other stations, they occasion a much smaller comparative amount of the sickness, and are, moreover, far less persistent and destructive. Everywhere at times, more especially during the summer and autumn months, there are occurring more or less severe outbreaks in particular ships, which it is often not easy to explain. Such local epidemics of diarrhœa, etc., are not unfrequent in ships lying in harbour on our

own coast, as well as in the Mediterranean and elsewhere. The diarrhœa is sometimes of a decidedly choleraic character, and occasionally sporadic cases of malignant cholera are met with, usually between the beginning of July and the end of September. Dysenteric affections are, as a general remark, decidedly more frequent and severe in the Mediterranean than in the Home fleet; but the mortality resulting therefrom is seldom considerable. On the West India station they are still more common, more especially in ships which have been long engaged off Greytown and some other ports in the Gulf of Panama. Dysentery is, however, far from being a cause of much fatality on the station generally. It is the East India and China fleet that calls for special notice under this head.

Out of the entire number, 492, of deaths caused by alvine flux (dysentery and diarrhœa) throughout the service in the three years, 425 occurred on this station; in the year 1858 alone, there were 252 deaths. It was on this station also that most of the deaths from cholera took place. Out of the entire number, 160, no fewer than 138 were in the ships engaged in these seas; and of these 110 occurred in 1858.

The excessively high rate of sickness and death on this station, not only during the three years under notice, but on all former occasions when our ships have had to anchor for a length of time in the estuaries of the large rivers, or off the low and swampy coasts of these regions, is a subject of great public importance. The nature of the sickness is almost always the same, viz.: the generally associated diseases

of dysentery and remittent fevers, of which, the former is far the more fatal of the two. The season of the year has much to do with their prevalence. From December to about the middle or end of April they are comparatively infrequent, but from May to November their prevalence and severity are enormously increased. Hence the necessity of keeping this fact steadily in view, in time of peace as well as of war, as far as the exigencies of the service will admit.

In 1841, such was the amount of sickness and mortality which followed the capture of Canton (during the hot season) that "it was almost fatal to the efficiency of the Naval force." In 1857, the city was taken on December 29th, and "notwithstanding the fatigue and exposure of the men, the number of febrile and diarrhœal attacks which followed was by no means great—owing, it is presumed, to the season of the year being more favourable to the health of Europeans than that chosen in 1841."

The attack on the Peiho forts in North China took place on May 13th, and on the 22nd the force proceeded up the river to Tiensin. The men continued in good health. On the conclusion of the treaty, the force was withdrawn and reimbarked in the beginning of July. On the whole, the expedition suffered comparatively little from sickness.

A good deal of the sickness on this station among the men is doubtless owing to their recklessness and wilful neglect of the most obvious precautions; for the officers, generally speaking, suffer much less in proportion, in consequence mainly of their greater attention to food and clothing, and of less intemperance.

The use of the water of the rivers, contaminated as it is with manifold impurities, has been reasonably enough suspected of having not a little to do with the excessive prevalence of alvine flux in the Indian fleet; this idea seems to be confirmed by the extreme frequency of intestinal worms among the sick. But this subject still needs further examination, as it is alleged that the crews of some ships, who have used only water distilled from their engines, have suffered as much as others where that practice was not adopted.

The occasional marked immunity of some ships from the diseases which prove so prostrating to others is highly suggestive, and demands a more searching inquiry than it seems yet to have received; for what is true of one vessel may reasonably be expected of others under like conditions. There is certainly not a more important problem in Naval and Military hygiene than clearly to determine all the circumstances which favour the induction, and aggravate the severity, of alvine flux. The food, the drink, the clothing, the exposure, the nature and amount of fatigue duties, the accommodation of the men, the mooring of ships, the site of barracks, these and many other points all need to be examined into.

That the tendency to diarrhœa and dysentery is greatly increased by the breathing an impure atmosphere is, as already stated, a recognised fact in medical science. They are the most common pest of crowded and ill-found emigrant and troop ships in all climates, and no diseases have been found more wasting to armies whether in the field or in unwholesome quarters and cantonments.

Overcrowding in a ship will, indeed, occasionally

continue for a considerable time without being followed by any distinct disease, such as fever or flux; but that the health of the persons so treated is deteriorated is shewn by the fact of their being more than usually susceptible of all noxious agencies, on landing after a lengthened voyage. This truth was terribly exemplified in the case of some of our regiments—the 98th for example—in 1841, which lost half their force within three months of landing in China. And, as if to make the experiment complete, it was found that the men who had been quartered on the orlop or the lowest and worst aired deck in the *Belleisle*, in which the regiment had been brought out from England, suffered in a higher ratio than the others.

The power of resisting the hurtful influences of a malarious climate depends quite as much upon the maintenance of a vigorous tone of health throughout the voyage up to the moment of landing, as on the vigilant use of precautionary measures after arrival.

As to the influence of Diet on the prevalence and character of dysentery in India and China, it has been observed as the result of long experience that the disease is much less frequent and severe among the natives than in Europeans, and more especially among British sailors; and this difference has been attributed mainly to the use of a less stimulating diet, and to the non-use of spirituous liquors.

On the subject of the water used for drink, it is to be remarked that the Chinese are said to generally boil it, and then add a little alum to it. "It is worth mentioning," adds the Naval Report of the health of the Navy for 1837-43, "that a number of Chinese prisoners who were confined for some time on board

the *Cornwallis*, and who had no opportunity of boiling the water they used, or of adding alum to it, suffered from diarrhœal attacks somewhat in the same ratio as the ship's company."*

With another interesting extract from the same report, I conclude this part of the subject. "The more general prevalence of diarrhœa and dysentery amongst Europeans residing or voyaging on the coast of China, and even to some extent on nearly the entire southern sea-board of the Asiatic continents, than amongst aliens of the same class residing in other countries or regions in the same parallels of latitude, is a most remarkable fact; whether these affections arise from some peculiar condition of the atmosphere, from telluric emanations, peculiarity of food or water, sufficient evidence has not yet been adduced to enable us to form anything like a satisfactory opinion; for it appears to be a fact, established on the testimony of many intelligent medical officers, that diarrhœa has sometimes attacked the crews of vessels on entering the rivers in China before they had any communication with the land, and before they had made use of any article of food or drink belonging to the locality. Hence in these cases it was generally supposed that the disease originated from malaria or marsh exhalations suspended in the atmosphere; but

* The elixir of vitriol, or dilute sulphuric acid, may be advantageously substituted for the alum. A very pleasant and useful beverage, I may remark, in hot climates and seasons, is made by adding a sufficient quantity of it to water, (or, what is still better, to cold tea), to impart a grateful acidity, sweetening to the taste. This is the *sulphuric lemonade* of some French hospitals. I have known it used with decided advantage as the common drink in diarrhœal and choleraic seasons, and can recommend it from personal experience.

then again, at other times, there were ships' companies who entirely escaped these affections until they began to use the river-water. Thus the evidence which appeared to be conclusive as to the influence of malaria on the health of the crew in one ship was found to be wanting in another, while the evidence which appeared to be equally strong as to the influence of the water in a third was, in a manner, negatived by the eruption of the disease in a fourth before the men began to use it."

Diseases of the Respiratory Organs, including Consumption.

The amount of sickness in the Navy generally from these maladies exceeds that from any other single class of diseases, and often equals that from all fevers and alvine fluxes together. To take one year for example—in 1856, a sixth part of the entire sickness throughout the service arose from this cause. The proportion varies, as might be expected, on different stations; but the influence of mere climate is by no means so great as is generally supposed. For although not so high as in the Home station, where atmospheric vicissitudes are more rapid and considerable than elsewhere, there is still an immense amount in the milder and more equable regions of the Mediterranean, and even under the tropical skies of the Old and New World alike. The mere inclemencies of weather at sea, even when combined with exposure and great fatigue, have much less to do with the frequency and severity of these ailments than most people suppose; but it must be acknowledged that the reckless habits of seamen when on shore, and their disregard of

ordinary precautions against wet and cold, contribute not a little to their production. But with chest and throat diseases, as with fevers and diseases of the bowels, we have again to notice the curious fact that there is often a marked difference as to their prevalence in different ships of the same squadron, lying at the same localities, and engaged on the same or similar duties. Whether this difference is mainly owing to the damper state of the between decks in some ships than in others, according as the wet or dry mode of cleaning them be in vogue, or whether some crews have greater facilities of drying their wet clothes and getting warm food or refreshment on going down below after a cold and stormy watch and before turning into their hammocks, or whether from any other cause it is not easy to say; but that such a difference exists is a notorious fact, and one that well merits examination.*

The point which might least have been anticipated in respect of this class of maladies in the Navy is the great frequency of tubercular disease of the lungs, or pulmonary Consumption. Sea-faring life is usually considered as prophylactic of, rather than predisposing

* "Generally speaking," says the Report for 1856, "the comparative frequency of inflammatory affections of the lungs, in the Home Force, is to be ascribed to the exposure of the men to cold and wet, which it is difficult to avoid when there is a necessity for employing them on dock-yard duties and in boats, and their being quartered in cold, damp, and windy hulks during the winter months, where they have few opportunities for drying their clothes." As showing the difference in different ships' crews, employed in similar work, it is stated that "in the *Royal William*, the *Hawke*, *Formidable*, and *Blenheim*, there did not occur a single case of inflammation of the lungs and pleura, while in other ships they amounted, in some instances, to eight, and even to fifteen or sixteen."

to, the weakened and deteriorated state of the constitution on which the development of this disease depends; and experience has certainly shewn that civilians, with a decided tendency to it, have often got rid of every symptom by making a few lengthened voyages. How comes it then that the malady is so common among our seamen, and this too not on one station only, but in almost every part of the world to which our fleets are sent?

We are not surprised at the amount of mortality from this cause among the crowded tenants of the ill-aired dwellings of our manufacturing towns—ill-fed it may be, and often insufficiently clothed; but that it should be equally or even more frequent among our well cared for sailors, with the pure air of heaven always around them, is certainly what was not to be anticipated. Consumption is the most uniform and persistent cause of the large destruction of life in our Navy. Fevers, cholera, dysentery, and, indeed, every other malady vary in point of frequency; in some seasons they are very prevalent and fatal, in others they are comparatively infrequent and innocuous; but in all years, and nearly alike in all climates, phthisis eats its slow and inevitably fatal course into the strength of our Navy, and causes on the whole a greater amount of permanent loss to the service than any other single malady. During the three years, 339 deaths were caused by consumption, and 111 by other diseases of the respiratory organs, chiefly pneumonia and bronchitis. In the same period, 533 seamen were discharged out of the service on account of consumption (which in the great majority of cases would prove fatal within six months of their dis-

charge), and 171 on account of other confirmed pulmonic diseases.

The ratio of the deaths from consumption alone averaged, for the three years, 2·6 per thousand of strength; and the corresponding ratio of the number of men invalided on account of this disease was 3·9. The amount of the permanent loss from this one disease is thus seen to be excessively great.

One remark only as to the predisposing and favouring causes of this evil—a wide subject if discussed in its various bearings—need be made at present, merely to recall to general attention the well-considered conclusion of the recent Royal Commission on the sanitary state of the Army respecting the cause of the great prevalence of pulmonary consumption among our soldiers generally, and its inordinate frequency among the household troops, viz., the close foul air of the crowded barrack-rooms at night.* Is the atmosphere of the lower between decks of a ship of war, after the men have turned into their hammocks, at all less impure? To use a common phrase, it is so thick that you might cut it. And when it is

* The words of the Commissioners' Report are these: "That the ravages committed in the ranks of the army by pulmonary disease are to be traced, in a great degree, to the vitiated atmosphere generated by overcrowding and defective ventilation, and the absence of proper sewerage in barracks."

The inquiries which have recently been made, to ascertain the causes of excessive mortality from lung diseases in certain districts of England, have led Dr. Greenhow to the conclusion that, "working in ill-ventilated and over crowded rooms," and "residing in dwellings so constructed, that the bedrooms are badly ventilated, and the cubical space per head is inadequate to the preservation of health, powerfully aid the operation of other injurious conditions in favouring the development of these disorders."—*Report of the Medical Officer of the Privy Council*, for 1860.

remembered that the men have suddenly to turn out from this close, damp, and fœtid air at night to go suddenly on deck in all weathers, the exceeding frequency of those illnesses, which always serve to accelerate the development of tubercular disease, is only what might be expected. That a large amount of the inflammatory affections of the throat and lungs in the Navy is due to the cause here indicated, will not be questioned by any medical officers in the service; and the experience of the present day is but the repetition of what has been strongly and repeatedly testified to by former observers. Sir G. Blane pointedly alludes to this subject as calling for the attention of the Admiralty in his day, and as one where salutary improvements were manifestly required. In the present day, when most ships of war are provided with steam power, and the heat of the between decks is, therefore, apt to be still greater than it used to be in former times, the necessity for the suggested improvements is the more pressing.

Diseases of the Brain, etc.

There is no class of diseases so fatal, in proportion to the number of attacks, in the Navy as those of the nervous system. By far the greater number of deaths under this head (there were 172) are due more or less directly to intemperance, and are classed under the designation of apoplexy and delirium tremens. The number of men hopelessly ruined in health and discharged as invalids from the service, chiefly from epilepsy and insanity,* swells the above figure to

* In the three years, seventy-six seamen were invalided on the ground of insanity; and that a good many who were discharged on account of

501, representing the total permanent loss in the course of the triennial. But even this aggregate gives but a very imperfect idea of the entire sacrifice of life and service arising from this national vice; as it is well known that, independently of many febrile and other attacks attributable to intoxication and its consequences, very many of the violent deaths from drowning, suicide, etc., occur, and nine-tenths of all the crimes and offences are committed, while under the influence of liquor. How to diminish this great public evil by the substitution of acceptable and less pernicious beverages, and in other ways, is still a question for further inquiry, although it has more than once come under the consideration of our Naval authorities.

Amount and Causes of Invaliding in the Navy.

The amount of permanent loss to the service by Invaliding *from disease alone* always largely exceeds that by Death from the same cause. During the three years, the relative proportion was two-fifths greater. The total number in this period invalided was 4221, and of this aggregate 3808 were from disease alone; the deaths during the same time from disease being 2125. Diseases of the lungs were the occasion in 692 cases, and three-fourths of these were consumption. Diseases of the bowels, chiefly dysentery, afforded 585; of this number 324 were from

epilepsy, palsy, and delirium tremens, would eventually lapse into some form of mental weakness can scarcely be doubted.

"The great proportion of maniacs among seamen is chiefly owing to injuries of the head received in a state of intoxication."—Sir G. Blane.

the East India and China fleet, in 1858 alone. 162 cases were due to the sequelæ of fevers.

Various maladies which add but little to the death-list, annually cause a large amount of invaliding. In the three years,

448 cases were due to Rheumatic affections.
286 „ „ Diseases of the heart.
263 „ „ Ulcers and abscesses.
244 „ „ Hernia or rupture.
243 „ „ Venereal diseases.
235 „ „ Debility—complicated generally with some internal organic mischief, often of the lungs.

The great prevalence of rheumatism, with its disabling effects, is mainly due to the same external influences which occasion so much sickness from diseases of the organs of breathing;—viz., the cold damp state of the between decks in some ships; but principally to the abrupt transitions at night from the heated atmosphere below, when the pores of the skin are open, to, perhaps, a cold and wet watch on deck. The combined loss from these two orders of disease alone amounts to between a third and a fourth part of the total number of men, invalided in the course of the year.

Losses by War, Accidents, &c., compared with Losses from Disease.

I have now to compare the losses arising from the accidents, including drowning, to which seamen are specially liable, and also from the casualties of war, with the losses which have been shown to result from disease. For this purpose I have selected the Baltic

and Black Sea fleets in 1854 and 1855, and the East India and China squadron in 1857 and 1858, during the period of hostilities with China and the Indian mutiny.

The total mortality in the fleets during the Russian war, including the naval brigade and marines serving with the army before Sebastopol, was as follows:

From diseases - - - -	1574*
,, accidental injuries, suicide, and drowning	228
,, wounds received in action - -	227
	2029

In the Baltic fleet, in 1854, only fifteen deaths occurred from wounds in action at Bomursund, Hango, etc.; and in 1855 there were but eleven, of which five occurred from an attack by the enemy on a boat's crew, while landing some Russian prisoners under a flag of truce.

In the Black Sea fleet, in 1854, the total number of deaths from the casualties of war, afloat and on shore, was ninety-four; of which sixty occurred from the attack by the fleet on the sea-batteries of Sebastopol, and nineteen in the naval brigade (about 1200 strong), between the 2nd October, the date of landing, and the end of the year.

In 1855, there were ninety-eight deaths in the brigade from wounds received in the trenches before

* By far the greatest mortality was from diseases of the bowels, principally malignant cholera; 861 of the deaths were so occasioned. Diseases of the respiratory organs caused 217 deaths; fevers 172 deaths, exclusive of 29 deaths from the exanthemata, chiefly small-pox; and diseases of the brain 58 deaths.

Sebastopol, and six on board ship, either in the Black Sea, or the Sea of Azof.

Among the East India and China squadron, in 1857, there were eighty-seven violent deaths out of a total mortality of three hundred and twenty-seven. Of these eighty-seven, thirty-eight were from wounds received in action: viz., twenty with the Chinese, and eighteen in the naval brigade (520 strong) serving in India, against the revolted sepoys. Twenty-nine deaths resulted from drowning, thirteen from accidents, two from suicide, three from causes not stated.

In 1858, out of a total mortality of seven hundred and six, of which one hundred and twenty were deaths from violence, thirty-five were from wounds in action, twenty-seven in China, and eight in India; forty-nine deaths were caused by drowning, seventeen by accidents on board ship, three by suicide, one by a stroke of lightning, and fifteen from causes not ascertained, but "probably the result of injury or violence while on shore on leave, or in action with the enemy."

In the three years, 1856-7-8, eighty-two sailors and marines lost their lives in action, and eighty-nine by drowning.

The facts now stated show how small is the proportion of deaths in our navy, from the mere casualties of War.*

* Like results occurred during our former protracted hostilities with the Chinese, from 1840 to 1843. "The total deaths from wounds received in action amounted to 24, or in the proportion of about one annually in the thousand of mean strength; while the total loss from febrile and dysenteric complaints alone amounted to 547, or in the ratio of nearly thirty to the same amount of force." Even as com-

Lastly, the proportion of men discharged out of the service in consequence of accidents and wounds, as compared with the number discharged on account of disease, is inconsiderable. During the three years, the number invalided from the former cause amounted to four hundred and eighty-three, out of a total of four thousand two hundred and twenty-one from all causes, or in the proportion of nearly a tenth part of the whole.

And now what are the inferences which seem to be fairly deducible from the foregoing facts and statements?

That a considerable portion of the sickness—the sickness, too, which is apt to be the most disabling and fatal—is owing to agencies which are well ascertained, and which are certainly not inevitable to ship-board life under any exigencies of public duty, will, I think, be generally admitted. The perfect soundness of the observation, already quoted on the title page of this letter, that "It is only by clearly and distinctly pointing out the causes which affect health, that we can hope to avert disease, and reduce the rate of mortality in the naval service," will be accepted by every sanitarian inquirer. Now, no one can well doubt as to the cause or causes of the exceeding and persistent unhealthiness of such ships as the *Conqueror*, the *Dauntless*, and the *Eclair*; or of the typhus fever generated on board the *Princess*

pared with the number of deaths from other kinds of external violence, that from gunshot wounds was but small; for the deaths from ordinary casualties, principally accidents sustained by falling from aloft or into the holds, were forty-one, and no fewer than one hundred and nine were caused by drowning, five of which were suicidal.—*Statistical Report of the Navy (East India Station).* 1853.

Royal, and the terrible malignancy of the yellow fever in the *Malacca*, and other vessels of the West India squadron in different years; or of the disastrous virulence of the cholera in the *Britannia*, at Varna. That the extreme sickliness and loss of life in the above instances were, to a large amount, avoidable, or, in other words, would not have occurred under circumstances less unfavourable to health, seems to me all but certain. And if this be true in regard of these ships, it is only but reasonable to believe that similar causes in other ships have given rise to like effects, though in a less degree, and varying according to the circumstances of each ship and her crew.

With respect to the all important subject of ventilation, it is now, I believe, nearly universally conceded, by executive as well as medical officers, that the accommodation for the men at night, in most ships of war, is insufficient;* and, also, that there is really no adequate reason for continuing the old usage of berthing almost all the crew upon one deck,

* The following description of the berthing of the men at night, and of its consequences, was given in the first *Statistical Report of the Navy*, in 1840. "The usual space between the suspending points (clues) of the hammocks is from seventeen to eighteen inches, so that, when they are extended by the beds, their bodies are in contact. The effect is to bring the bodies of the men into contact in greater or less number, according to the size of the ships. When at sea with a watch on deck, the accumulation and pressure are reduced by a half; but when in secure harbours, five hundred men perhaps sleep on one deck, their bodies touching each other over the whole space laterally, and with very little spare room lengthways. The direct results of elevated temperature and deteriorated air may be conceived; but it is not easy to conceive the amount of the first, nor the depressing and debilitating power of both, as measured by sensation, within the tropics. The tendency of such a state of things must be to subvert health, and lay the subject of it open to attacks of serious disease."

and that, generally, the least well-aired. I have elsewhere expressed my sentiments on this subject (*vide* Appendix), and beg to refer to them.

The between-decks of some ships are, it is known, so hot and close that for several months at a time, within the tropics, the men are compelled to sleep on the upper deck under canvas. The ordinary wind-sails are most imperfect ventilators at best; and often they cannot be used when most wanted. A good system, whereby the purity of the air in the lower decks may be maintained, especially when the ports are closed, is still a desideratum. Whether the Committee of Officers, that has recently been appointed to suggest means for improving the ventilation of war steamers, has had their attention directed to the berths of the crew, as well as to the engine-room, etc., I am not aware. It is a point that calls for special consideration, as of recent years almost all the instances of extraordinary mortality have occurred in steam vessels. Indeed, the whole subject of the relative healthiness of sailing and of steam vessels needs to be looked into. In the Baltic fleet in 1854, there was certainly a lower sick rate in the sailing ships of the line, than in the screw liners; and the former suffered much less from diarrhœa and cholera than the latter. In the Black Sea fleet too, in 1854, and again in 1855, the *Queen* and the *Rodney*, both sailing ships, were the most healthy of the squadron. Probably this is just what might be expected, considering the greater heat and closeness, as well as the large store of coal or other fuel, on board steamers; unless, indeed, extra means are resorted to for maintaining a more thorough circulation

of air—a purpose which the machinery in action may always be made to subserve.

It has been seen from the evidence of many officers that the condition of the holds in some ships is very far from what it is desirable that they should always be; for that the exhalations from the lodgment of offensive matters there, and occasionally from the timbers themselves, are productive of mischief to health and predispose to and greatly aggravate, if they do not directly engender, serious disease, can scarcely be doubted. This conclusion is only in accordance with the daily experience of civil and military life in like circumstances; for a foul hold is only a lengthened drain or gutter without the means for the ready escape of its contents, and these too subjected to constant shaking about from one side to the other. The miasmata from such a hold are sometimes spoken of as if they consisted merely of sulphuretted hydrogen—a gas, which, though certainly most noxious to life, cannot be regarded as ever the generator of fever, flux, or gangrene. The gas is but the accompaniment and the evidence of a more serious effluvium; the real source of the mischief arises from the putrescent decomposition of organic matter. Such miasms are, I believe, only less mischievous than the miasms proceeding from living bodies.

Sometimes, and even of recent years, the hold of a ship has been found to be anything but sweet shortly after she has been put into commission. This may have arisen from the practice of keeping a certain number of ships in an advanced state, *i.e.*, ready for commission, with their ballast on board, it may be for several years. When this is once disturbed by the

motion of the ship, the existence of something faulty may be only then discovered. Hence the desirableness that a thorough sanitary inspection and report be made of every vessel before she goes to sea, as well as upon her return to port at the end of her commission.

That not a little of the pulmonic disease, and also of the rheumatism, among seamen is capable of prevention is more than probable when we consider the very frequent cause of these ailments, viz., the abrupt transition from the overheated berth to the cold outer air, on every change of night watches. Humidity, too, is a great promoter of sickness. The dryer dwellings are, the healthier *cæteris paribus* they are. Medical officers are pretty generally agreed that damp lower decks serve to swell the sick list, and that it would be better for the men if dry cleaning and rubbing with hot sand often took the place of washing and wet holy-stoning. What was said in the first published Health Report, in 1840, on this subject was the result of extensive experience on the part of Dr. Wilson in all parts of the world ;—" Evaporation, especially in low decks and low degrees of temperature, goes on slowly and, therefore, long ; in hot climates it is, of course, more rapid and sooner completed ; but in either case there is strong reason to conclude that the effects on health are injurious, sometimes highly so. Their power to excite catarrhal and rheumatic affections will not be questioned ; nor ought there to be much question as to their power of exciting many of the inflammatory affections of the lower extremities, which in some ships give rise to much inconvenience and suffering. They tend to

reduce physical force, and thus co-operate in the induction of diseases of debility, or render the body more susceptible of attacks of violent disease."

It is unnecessary to say that it is always of much importance that the men should have the ready means of quickly drying, in a suitable place, their wet clothes when they go below.

The hurtful effects on health of a humid atmosphere are aggravated by the inevitable absence of sun-light from the lower decks of a ship. This point has not escaped the attention of Dr. Bryson in his suggestive paper on Medical Statistics in the Manual of Scientific Inquiry, prepared for the use of officers in H. M. Navy by authority of the Admiralty.*

On the subject of the food and drink in the Navy I have but little to say, and that little will have reference to the East India and China squadron, which, as we have seen, suffers so disproportionately from unmanageable and very fatal bowel complaints. It must be admitted, I fear, that our multiplied experience in Chinese waters for many years past has not yet enabled us to reduce the amount of sickness and mortality to which our ships of war are liable, whenever they have occasion to be long detained in any of the great estuaries. But it would be unjust

* "The marked difference in the appearance of men employed in the bread room and holds, compared with those who are freely exposed on deck, or in open boats, at all hours of the day, cannot escape the notice of the most superficial inquirer. It is, therefore, of importance to ascertain whether exclusion from the solar rays be not, to a greater extent than is generally believed, one reason why men who have acquired a pale waxy look from confinement below are more susceptible of disease, and less capable of sustaining its shock, than are those whose blood is enriched and strengthened by the free exposure to light, heat, and air." —P. 240, 3rd edition, 1859.

to sanitary science to believe that no reduction can possibly be effected in such a climate. That the climate has much, very much, to do with the extreme sickliness is beyond dispute ; but then what are the circumstances and conditions which predispose the system to be most promptly and injuriously affected by the climate ? Experience seems to point first and mainly to the nature of the *ingesta ;* and, secondly, although in a minor degree, to exposure, especially at night and early morning, without due precautions. That the avoidance, as much as possible, of salted meats, and the substitution in smaller quantities of fresh meats with a larger allowance of rice, and, also, the more frequent issue of baked bread in lieu of biscuits, are most desirable, more particularly during the six hot months of the year, is the natural inference from what we know to be the pathological condition of the alimentary canal in dysenteric affections. And for the same reason, we are pretty sure that the daily issue to the men of a sound wholesome wine, in place, and to the exclusion, of ardent spirits could not fail to be beneficial. Of course, there may be difficulties in the way of carrying out such changes to the extent to which it may be deemed desirable ; but still it is highly important to discover at all events what are the favouring, and what are the aggravating, agencies of so disabling and so destructive a disease to our Navy as dysentery. The influence of the water used on board for cooking, etc., is one of the points which appear to be far from being clearly determined, although it is difficult to believe but that the quantity of organic impurities in the Chinese rivers must have a pernicious effect on health. We

require to have a series of accurate chemical and microscopic examinations of the water in different localities, so as to compare the results, not only with each other, but also with the ingredients in the river water of other similar regions, where bowel complaints are less frequent than in China.

How to guard against the recklessness of the men when they are on shore, in respect of intemperance and other matters bearing on their health, I am incompetent to form an opinion ; it is only the experienced officer who is entitled to speak on the subject. It is enough for my purpose merely to point once more to the sad sacrifice of health and life, that is still traceable to intoxication in the Navy upon all stations. Things are certainly not so bad as they were forty years ago, when half a pint of spirits was served out daily to every lad and man, throughout the service, whether they wished for it or not. Still much remains to be done to lessen the amount of intemperance among our seamen.

To effect a salutary change in this as in every other branch of naval hygiene, it only needs, I believe, that the attention of all the officers of the service, executive as well as medical, and of the general educated public also, be continually directed to watch the influence of every circumstance affecting the preservation of health and the occurrence of sickness in ships, and that all encouragement be given by the administrative authorities for the promulgation of sound opinions, and the tentative adoption of reasonable suggestions. Let no one permit himself to believe that any thing like perfection has already been attained. We have seen what extraordinary

success Captain Cook achieved, now ninety years ago, in preserving the health of his crew; and we know that instances of similar and even greater success have since been attained by following a like course of action. For example, to cite only one or two cases. About the beginning of the present century, the *Glatton* made the voyage round the world and returned to England after twelvemonths absence without the loss of a single one of her crew, 170 in number; and this, too, notwithstanding that she had carried out upwards of 400 convicts to Botany Bay, on the passage out (*vide* Appendix). And on the last of Captain Parry's Arctic voyages, the annual mortality of the crews was at the rate of only 0·5 per cent. of the strength.

It would be a fine thing, certainly, for science and humanity if ten per cent., say, could be struck off from the present ratios of sickness and mortality throughout the Navy. The saving of the loss of service, not to speak of the expense, would be of no slight consequence in a national point of view. Just in proportion, too, to every diminution of disease and death, so, we may be assured, will the robust tone of health and the vigorous alacrity of the well men be enhanced; for it should never be forgotten that there may be, and certainly is, a great deal of lowered health in all communities, short of the occurrence of actual illness. The problem of State Hygiene is not only how to prevent sickness in the public service, but how to maintain the highest possible effectiveness of the men. For the working-out of this problem in the Navy, the more that the medical officers of our ships are regarded in the light of preservers of health, and not merely of healers of

disease, the better; and, certainly, in no branch of the profession can abler and more enlightened men be found than in the medical department of the navy. The more, too, that the bearings of sanitary science are studied by the executive officers, the more they will, I am sure, appreciate their importance, and the more efficient aid they will be ever ready to give to all the recommendations of the medical officers. It is only necessary for them to peruse, from year to year, the very instructive Statistical Reports of the service, to fully understand how much the health of a crew depends upon the condition and sanitary arrangements of a ship.

In conclusion, I will only add that every step of practical progress in the hygiene of the Royal Navy is sure to react with prompt benefit on the health and general welfare of our Mercantile Navy,—which, of course, and rightly so, will always take as a standard for their guidance and example in such matters, the experience of our ships of war. And when it is considered that the number of merchant sailors employed in our foreign trade alone, exclusive of the large numbers on board coast steamers and sailing vessels, exceeds 200,000, and that often no small difficulty is found in obtaining the right sort of men for the service of this vast commerce, the magnitude and national importance of the subject are at once apparent. The best and the wisest, as it is the most humane, course is to use our utmost endeavours to prevent, by anticipative precautions, all unnecessary waste of available strength and power. That there is in our mercantile marine much preventible disablement and sickness—sickness too often termina-

ting fatally, either abroad in hospitals, or among our civil population in this country—is well known to every one whose attention has been drawn to the matter.* The hygienics, indeed, of our merchant seamen have not yet attracted that amount of public notice which their great importance demands. If something of the same system of accurate registration and record, which has for some years now been so beneficially carried out by the Board of Trade, in respect not only of the fabric and sea-worthiness of ships, and of the accommodation to be provided on board for crews and passengers, but also of meteorological, hydrographical, and other scientific observations, all for the good and safety of the service, were extended to the no less important topic of the Vital Statistics of the men employed, results of inestimable advantage could not fail to be obtained. This subject has, I am glad to say, been quite recently taken up by my distinguished friend Dr. McWilliam, Medical Officer of Her Majesty's Customs, in a paper read at the last annual meeting of the National Association for the promotion of Social Science; and it is much to be hoped that his

* "The sanitary and hygienic state of merchant shipping is often very faulty; and there is good reason to believe that there is at all times a large amount of sickness, damaged health, and premature disablement among the merchant seamen, which might be easily prevented by simple precautionary measures." * * * "The sanitary condition, too, of most seaport towns, and more especially of those parts near which the shipping is lying, is generally reported to be extremely unwholesome, and calculated, if not to engender, inevitably to aggravate many of the diseases against which quarantine is directed."—*Report on Quarantine, by the National Association, etc., printed by order of the House of Commons*, August 1861.

extended inquiries may eventually lead to the recognition, by the Government, of the extreme desirableness of establishing a more full and accurate registration of the sickness and mortality among our merchant sailors than has hitherto existed.

I have the honour to remain,
Sir,
With great respect,
Your most obedient Servant,
GAVIN MILROY.

London: March 1862.

APPENDIX.

Unhealthiness of Sheerness and neighbourhood; influence on the Ships of War, Dockyard, &c.—Vide p. 30.

"Information showed, beyond question, that the population of the entire island of Sheppey is, to an enormous extent, afflicted with the effects of marsh-malaria, generated partly within the island, and partly on other adjacent mud-lands or marsh-lands about the Swale and the Medway; and that the diseases thus engendered occasion an immense amount of physical suffering, a very large interference with industry of all kinds, and a serious detriment to the efficiency of Her Majesty's service in that important locality."

Among the crews of the *Edinburgh*, and of the Steam Ordinary, averaging 1251 in number, 130 cases of malarial fever, 64 cases of rheumatism and neuralgia, and 81 cases of colic and diarrhœa occurred during 1857 and 1858; occasioning a loss of 2132 days service in these two years. A similar amount of the same sort of sickness prevailed among the crews of the *Waterloo* and *Formidable*, while at Sheerness, during part of 1858. The proportion of attacks of fever per thousand of the whole naval force was 106, and the average duration of each attack was very nearly nine days.

The Garrison Artillery, as might be expected, suffered still more than the population afloat. In 1856-57-58, no fewer than 344 cases of fever in an aggregate force, for the three years, of 2086 men. The average length of each attack was the same as in the Navy.

As to the workmen in Her Majesty's Dockyard (whose numbers averaged nearly 1700 during the three years), it appears that "of every 1000 men employed, more than a third part (perhaps more than half) suffer during the year from disorders which more or less decidedly are referred to that cause; viz., that 146 of them suffer fever, and that each of the 146 is thus kept from his work for (on an average) 9 4-5ths days; that 63 of them suffer neuralgia or other like pains, and that each of these 63 is thus kept from his work for (on an average) 10 3-5ths days; that 158 of them suffer from bowel-complaints, which are mainly attributed to the same sort of local influences, and that each of these 158 is thus kept from his work for (on an average) 5 days; besides that a very large amount of unrecorded illness and disqualification prevails among other members of the force."

With so much endemic sickness, it is not wonderful that Sheerness is said to be spoken of, at Chatham hospital, as "the African station of our home service."—*Report of the Medical Officer of the Privy Council*, for 1859.

Yellow Fever in Ships of War; *effects of landing the sick*.—*Vide* p. 33.

"The great and most important practical question arises, is it safe to permit the sick persons from such a vessel as the *Highflyer*, to be landed among a healthy community? This question was put to me, and, fortified in the opinion at which I had arrived by the results of many similar experiments in this place, I recommended that there should be no interruption to the *Highflyer's* people communicating with the shore; but intimated that it would be dangerous for strangers to be exposed to the atmosphere of the ship, so long as the disease continued in her. There has been no interruption to the communication of the *Highflyer's* officers and men with the shore; her sick have been in proximity with a considerable number of surgical cases from the other ships in the hospital, and with a large proportion of the crew of the *Persian*, affected with a malarious fever.

"No single instance of any kind of fever followed the landing of the *Highflyer's* sick, or the free intercourse of her officers, stewards, and people with the town, either in the hospital or in the town.

"I have witnessed and watched the progress of so many epidemics in this place, as to feel perfectly satisfied that any contagious powers the disease may possess in crowded ships, is speedily rendered inoperative by moderately good ventilation; and that the best mode of checking the progress of such diseases is to remove the sick to roomy quarters on shore as speedily as possible."—*Report of* Mr. Watson, *Medical Officer of Port Royal Naval Hospital, printed by order of the House of Commons*, May 1853.

Mr. Watson and Deputy Inspector Dr. Wingate Johnston were at Port Royal when I was in Jamaica, in 1851, and with both these gentlemen I had frequent opportunities of inspecting the ships of war, and the large naval hospital on the station.

In the dispatch of the Governor of Barbadoes to the Right Hon. Sir J. S. Pakington, Secretary of State for the Colonies *(printed by order of the House of Commons*, March 1853), we read:—

"In forwarding a copy of the report of the Health Officer,* on which the sick of the *Dauntless* were removed to the military hospital, it is very satisfactory to find that by observing the precaution recommended, the disorder was not in a single instance

* "The sanitary measure that I advise, is an immediate removal of the sick to the shore, taking proper precautions for an efficient segregation of them."

extended to the troops, affording, as it does, a strong confirmation of the soundness of the views by which the board have been guided."

Captain Halsted, in his letter to the Governor, mentions that "on the ship's first arrival, all communication with her was peremptorily stopped, an exclusion which still continues with regard to all but the *native* labourers and servants employed on board." The omission of this necessary precaution: viz., of employing only the coloured natives to go off from the shore on board a fever-smitten vessel in the tropics—occasioned, it is to be feared, the spreading of the disease to the unacclimated boat's crew of one of Her Majesty's ships, recently at Port Royal, with very disastrous results. The most regretable point in the history of the *Dauntless* was the not landing the whole, or greater part, of the crew, the unattacked as well as the sick, as soon after arrival as possible. A large number of valuable lives might thus have been saved; as fresh cases, very many of which proved fatal eventually, continued to occur on board for several weeks afterwards.

Defective Ventilation in Ships of War.—*Vide* p. 55.

"In consequence of the very fatal outbreak of malignant cholera in the fleets at Varna in the preceding year, when general alarm was occasioned in the land and sea forces of the allies, and the expedition to the Crimea was thereby considerably delayed, the Lords of the Admiralty considered it advisable in the summer of 1855 to put the Commission in communication with the Admiral in command and with the principal medical officer of the Black Sea fleet, in the event of epidemic sickness again prevailing in the squadron."

"A minute inspection of the *Royal Albert* was made by Dr. Milroy, in company with Dr. Brien, the principal medical officer, and subsequently of the *Queen*, with Dr. Deas, Inspector-General of the fleet. Especial attention was paid to the arrangements on board ships of war, which are generally believed to have most influence in predisposing the crew to attacks of epidemic diseases, and in rendering these attacks formidable. The foremost of these is the amount of accommodation between decks for the men at night. In line-of-battle ships, the lower gun deck is reserved for this purpose; in two-deckers, the marines as well as the seamen sleep there; but in three-deckers, the marines and boys occupy the fore part of the middle deck. From 600 to 800 men, according to the strength of the crew, are thus usually berthed on the lower or main deck. By the relief of watches every four hours, there may never be more than one-half these numbers in their hammocks at one time; but, nevertheless, the whole have to sleep on that deck from night to morning. * * * When the ports are closed, the only means of admitting fresh air is by the hatchways, with or without the aid of windsails, so that the same openings serve the double purpose of entrance and escape.

"On board the *Royal Albert*, and in other *screw* line-of-battle ships, most of the officers have their cabins on the orlop deck, where all the midshipmen and mates also sleep. This arrangement, introduced of late years, must serve to render the atmosphere in the main deck still more impure; the heated breathed air from the orlop deck passes into it. The officers' cabins are apt to become quite stifling when the scuttles are shut, more especially when the furnaces are lighted.

"The accommodation for the sick in screw ships, as in the *Royal Albert*, is, in several respects, inferior to that on board sailing ships of the same class. The sick-bay is much smaller, occupying only one side of the upper deck forward instead of its entire breadth. It is not nearly so well ventilated, and does not admit of being so well ventilated. It is, moreover, exposed to contamination of atmosphere from the faulty arrangements of the water-closets, which have been adopted in the new ships.

"That the ventilation of the between-decks, and of the cabins, is capable of being greatly bettered by sufficiently simple means cannot be doubted. Still it is very questionable whether, by any means, it can be made so perfect as to render the air at night as pure as is desirable, or even safe in certain seasons, while the crew continue to be crowded together on one deck, and that deck the lower one. At least one-half of the best sleeping space in a ship of war is, in ordinary circumstances, left unoccupied. It is only made available when there is much sickness on board, and then it is used as part of the sick-bay. There appears to be no other reason for its non-occupation at other times, but the practice hitherto of the service. Free space and pure air are, however, as necessary for the prevention of disease, as for its mitigation and arrest.

"The changes in the accommodation for the well and sick, adopted of late in the new screw line-of-battle ships, have had the effect of diminishing the amount of space, without any concomitant improvement in the ventilation of the decks. This point requires the more notice, as the heat on board a steamer is of course greater than in an ordinary sailing ship, and the atmosphere is liable to become more oppressive. Many of the most fatal outbreaks of pestilence in the navy of recent years have occurred in steamers."
—*From "Notes on Ships of War," by* Dr. Milroy, *in Report of the Sanitary Commission to the Army in the East.*

From a letter which Dr. Deas wrote me from the Bosphorus to Balaklava in November, 1855, I extract the following passage:—
"The want of ventilating tubes, whether fitted into the ship's sides or otherwise, is common to all the decks, and is, doubtless, the cause of some mischief. And insisting on the lower deck in two-decked and frigate-built ships, and the lower and middle in three-deckers, being the only decks for sleeping the whole of the crew is, I fear, the source of still greater evil. *They clearly ought to be distributed over all the decks.* * * * There is no attempt at a

ventilating tube, leading either to the upper deck or into the steam funnel, or anywhere else, from the officers' cabins (on the orlop deck); and these cabins must become most destructive to health, especially when the steam is up." Dr. Deas mentions, also, the want of proper accommodation for the reception of the wounded in action in screw liners, and of the bad state of the cock-pit generally in these vessels. The opinion of so experienced and able an officer is, of course, entitled to great weight.

Diet of the sailor in malarial climates.—Vide p. 59.

Deputy Inspector Dr. Smart, in a valuable paper on the Diseases of the Navy at Hong Kong, just published in the *Transactions of the Epidemiological Society*, draws attention to a point of no small moment in the preservation of health in both public services. "From this," (*i. e.* the diurnal ranges of temperature from a high heat to great chills), "we should derive a very important indication, not always attended to, to watch carefully that our men on night duty are well protected by warm clothing, and fortified by the stimulus of warm food and drink during the night and towards dawn. By routine we crowd the aliment of our men into a few hours before and after mid-day, by which the system is left without support when most urgently demanded to ward off the depressing influences of climate. I am convinced," adds this experienced observer, "that the invasion of diseases, which have cost the lives of hundreds of our brave seamen and soldiers, has been greatly owing to this erroneous system."

The point here indicated was carefully attended to in the case of our troops during the late operations in China, and, as was to be foreseen, with most salutary effects.

Case of the Glatton; mode of ventilation, vide page 61.

This vessel, one of the old East Indiamen class, was fitted up specially, under the direction of Count Rumford and Sir G. Blane, for the conveyance of convicts to Botany Bay, in consequence of the great mortality which had previously taken place in the transports employed in this service. The voyage was performed without either fever, flux, or scurvy occurring on board, and with the loss of only five of the male and two of the female convicts from chronic diseases.

The means adopted to insure effective ventilation of the between decks were a series of air-tubes passing up from where the convicts slept to the open air; also a narrow opening amidships along the whole length of the upper deck, protected by a pent-house covering raised a few inches above it to prevent rain, etc., from entering, and scuttles at the side to open or shut according to the state of the weather. The air-tubes and the deck opening acted, of course, in all states of the weather.